

North Fork Siuslaw River Riparian Thin Project



Fisheries Biological Evaluation and Watershed Report

Prepared by:

Brandy Langum
Siuslaw National Forest Fisheries Biologist

for:
Oregon Coast Ranger District
Siuslaw National Forest

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Introduction

The North Fork Siuslaw River Riparian Thin Project (project) is a riparian thinning restoration project developed to enhance the vigor and growth of large conifers in the riparian area and accelerate the onset of late successional forest characteristics by reducing competition and simulating natural disturbance within three units along the upper North Fork Siuslaw River. This project totals 15.4 acres of National Forest lands and comprises zero acres of public land. The project area consists of the upper North Fork Siuslaw River subwatershed, (HUC 171002060701). The upper North Fork Siuslaw River subwatershed is a key watershed of the Northwest Forest Plan (USDA and USDI 1994). The Project area is located in portions of Township 17S, Range 10W, Sections 6 and 7, Willamette Meridian, Lane County, approximately 40 miles southwest for Corvallis

This Biological Evaluation (BE) considers the environmental effects of the project on watershed function and resiliency, streams, water quantity, and water quality in respect to the forest plan and the Clean Water Act. Fish species of special conservation concern (e.g., federally listed, USFS sensitive, USFS management indicator species) within the aquatic environment analyzed in this report include Oregon Coast Evolutionarily Significant Unit of Coho Salmon (*Oncorhynchus kisutch*), and also evaluates the effect of these alternatives on Essential Fish Habitat (EFH) as designated by the Magnuson-Stevens Fishery Conservation and Management Act. It also evaluates coastal Steelhead (*Oncorhynchus mykiss irideus*), listed by the US Forest Service as Sensitive on the Regional Forester's Special Status Species List (2011) and as a Species of Concern by NMFS (2004) and Pacific Lamprey (*Entosphenus tridentatus* – Oregon Coast) listed by the US Forest Service as Sensitive on the Regional Forester's Special Status Species List (2011), and also listed in the Oregon State Director Sensitive Species List. All analysis is based upon data available at the date of signing.

Note: Detailed analyses of federally listed fish species are provided in the North Fork Siuslaw River Riparian Thin Biological Assessment.

Regulatory Framework

Federal Law

- Endangered Species Act of 1973
 - All proposed activity categories are consistent and comply with the Endangered Species Act of 1973, and Endangered Species Act consultation on this project is currently in progress.
- Anti-degradation Environmental Protection Agency policy 40 C.F. R. Section 131.12
 - This policy states that existing water quality, even when it exceeds required levels for stated beneficial uses, will be maintained.
- Clean Water Act and the Water Quality Act
 - This project is also consistent and compliant with the Clean Water Act, 1977 and the Water Quality Act of 1987. Potential effects of the proposed action do not constitute a significant degradation of quality or impair existing beneficial uses, either through surface runoff of sediment and chemicals or chemicals entering water bodies through groundwater sources.

Forest Service Manual Direction

2672.41 - Objectives of the Biological Evaluation

1. To ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or contribute to animal species or trends toward Federal listing of any species.
2. To comply with the requirements of the Endangered Species Act that actions of Federal agencies not jeopardize or adversely modify critical habitat of federally listed species.
3. To provide a process and standard by which to ensure that threatened, endangered, proposed, and sensitive species receive full consideration in the decision making process.

ESA – Oregon Coast Coho Recovery Plan

RECOVERY GOALS, OBJECTIVES AND CRITERIA

The primary **goal** of the recovery strategy for the species is recovery of the species to a self-sustaining condition. Ecosystems upon which Oregon Coast coho salmon depend are conserved such that the species is sustainable, persistent and no longer needs federal protection. Two types of criteria allow for delisting based on best available science, they are:

- Biological recovery criteria – biological health (viability, sustainability and persistence)
- Threats criteria – listing five factors, and describes human activities (threats) that contributed to the decline in the status of the species.

Clean water Act

Congress has designated the State of Oregon the responsibility to implement the Clean Water Act. This act requires that water quality standards be developed to protect beneficial uses and a list be developed of water-quality-impaired streams (303d list). Water quality standards are based on life stages of fish and the most restrictive need sets the standard. The Summit project planning area is located in the Upper Malheur subbasin and contains streams considered under the 2012 Integrated Report and the 2010 Malheur River TMDL and WQMP (ODEQ, 2012; ODEQ, 2010). All water quality listings are for aquatic life, resident fish or salmonid fish rearing, spawning or migratory beneficial uses.

The Forest Service's responsibilities under the Clean Water Act are described in a May 2014 Memorandum of Understanding (MOU) between the Oregon Department of Environmental Quality and the Pacific Northwest Region of the USDA Forest Service. Collectively, the TMDL & MOU direct the US Forest Service to (USDA Forest Service, 2014):

1. “manage water-quality-limited water bodies on US Forest Service- administered lands **to protect and restore water quality**. Management will involve development and implementation of strategies such as BMPs to protect and restore water quality conditions when US Forest Service actions affect or have the potential to affect the 303(d) listed waters” (US Forest Service, 2014)
2. conduct BMP effectiveness and implementation monitoring.
3. not further degrade water-quality-impaired streams (i.e. streams on the 303(d) list for water quality impairments).

Description of Proposed Action

Thinning treatments in these overly dense plantation stands would be designed to enhance the vigor and growth of large conifers in the riparian area and accelerate the onset of late-successional forest characteristics, by reducing competition and simulating natural disturbance. Treatments would significantly improve the size of future large wood available to fall in the stream.

The following prescription elements are common to all treatments. The majority of trees providing primary shade and all trees providing bank stabilization, would not be felled. There will be a 30 feet no-treatment buffer and a 40 foot no-equipment buffer on all streams. Snags would be left for wildlife. Project design criteria (Appendix A) would be used to protect soil properties, future large wood, and bank stability. The three units proposed for treatment do not occur continuously along a stream but would occur in .15 to .25 mile reaches to mimic natural patterns of heterogeneity.

Project Elements

For the purposes of this analysis, the component parts of the proposed action are organized into the following Project Elements (PEs) shown below.

- Timber Felling (includes Silviculture prescriptions and yarding)
- Haul
- Fuels Treatments: piling and burning

Forest Service road 5084 is a paved county maintained road, no additional road maintenance work will be needed to complete this project. The PEs are summarized below.

Timber Felling and Yarding

Thinning will occur in three young, managed conifer stands (plantations less than 80 years old) (units numbers: 607703, 607107, and 607705) totaling approximately 15.4 acres in size. All three stands have been harvested and replanted in the past, making even-aged plantation stands. Increases in diameter growth rates have begun to diminish. Thinning prescriptions in these stands will leave 53 to 98 trees/acre after both thinning and post-harvest treatments (e.g., snag creation, down wood) are accomplished. “Thinning will be “Thinning from Below” with species preference, where the smallest trees are removed first until desired densities are achieved while favoring uncommon species and some trees with desired habitat characteristics. Specific Unit goals are:

607 705 – The prescribed treatment will be at the lower end of interquartile in order to elicit greater tree growth for future instream wood and increased large branch development for northern spotted owls and marbled murrelets.

607 107 – The primary purpose is to accelerate and increase tree growth, help create multiple canopy layers, maintain deep crowns, and increase understory plant diversity.

607 703 – The prescribed treatment will be at the lower end of interquartile in order to elicit greater tree growth for future instream wood and increased large branch development for northern spotted owls and marbled murrelets.

No thinning will occur within 30 feet of the river or any stream. There will be an equipment exclusion zone of 40 feet from the river and any stream within the project area. Harvest would include directionally felling trees away from the stream (see PDC's, Appendix A).

Post-harvest treatments for wildlife habitat include creating an average of four snags per acre from trees in the three units, and falling and leaving two trees (min 14 dbh, max 19 dbh) per acre. Cut trees, except for those left for coarse woody material, will be yarded to landing sites outside of the riparian areas.

Because of the flat terrain, all slopes are less than 5%, logs will be yarded using ground based systems. Designated skid trails that are approximately 15 feet wide and 150 feet apart will be used to minimize ground disturbance. Minimum buffer distance from stream edge and ground based equipment corridors will be a minimum of 40 feet. Yarding will occur in the dry season when soil moisture is low in order to minimize compaction. The predicted level of detrimental soil conditions is expected to be less than 10% of the treatment area. Because all three stands are located between the western side of the stream and road 5084, skidding will be away from the stream, towards the road. The far end of the skid trail closest to the stream, will receive the fewest number of passes by the skidder; the end closest to the road will receive the most.

Fuels Treatment (pile and burning)

Logging slash up to 100 feet from open roads (County Road/Forest Service 5084, and the access road to the North Fork Siuslaw Campground) will be treated to reduce the potential danger of wildfire. Treatment methods include construction and burning of hand piles within 100 feet of open roads and burning any machine piles on landings. At points where a road, unit, and stream are in close proximity to each other piles could be constructed at a minimum of 40 feet from the stream (Slash is usually collected within a 10 foot radius of the pile). This distance, combined with the 30-foot no treatment stream buffer, yields a 40-foot distance between the nearest hand pile and the stream where these set of conditions exist. Hand piles are typically 8 by 8 feet, 6 feet high and 20 feet apart. Hand piles will be placed away from residual trees to prevent damage and are burned in the fall after significant rain to prevent the spread of fire.

Associated Road Activities

Log hauling would occur between August 6 and February 28. All hauling will occur on a paved County maintained road (Forest Service Road 5084) that parallels the North Fork Siuslaw River and crosses coho CH five times downstream of the project area, with the exception of one stand (607705) requiring 300 feet of gravel road hauling that provides access to the North Fork Siuslaw River Campground. No additional maintenance other than the regular bi-yearly County maintenance (brushing, pulling ditches) will be needed on the haul route to complete this project.

Timing and Duration of Activities

Felling, yarding, and hauling activities for the three stands can occur within a single operating season. Fuels treatment (hand piling/pile burning) may occur during the following operating season. General operating seasons are determined based on times of the year that are available outside of northern spotted owl and marbled murrelet nesting seasons. Project operation dates are August 6 to February 28. Yarding would be further restricted to the dry season with no yarding being permitted past October 15. Because of the paved nature of the haul route (Forest Service road 5084) timber hauling could operate from August 6 to February 28

Environmental Baseline and Effects of the Proposed Action

This section provides general background information for where this project is located and then provide a specific discussion of the watershed and stream habitat condition at the watershed scale, and the ESA action area scale.

Affected Environment

All waters within the upper North Fork Siuslaw subwatershed drain through the project area except those of the McLeod Creek drainage. The major stream within the project area is the North Fork Siuslaw River. Forest Service road 5084 is the main road accessing the project area and is a paved County maintained road.

Within the project area, most of the low gradient stream habitat with the highest potential for coho production occurs on private lands in the upper North Fork Siuslaw subwatershed. There is a section of low gradient high value habitat in the main stem of the upper North Fork Siuslaw River on National Forest lands currently in a degraded condition; lacking the habitat complexity that in-stream large wood provides such as; deep pools, thermal cover, and associated spawning gravels. The total river frontage of these three units is approximately 0.35 miles along an approximately 1.15 mile section of the western side (river left, or road side) of the upper North Fork Siuslaw River.

Streamside vegetation in the project area lies within the wet western hemlock zone. Alder is often common in the over-story. Salmonberry and vine maple occur in the understories. Conifer tree densities in this vegetation type vary, with representative densities ranging from 54-124 trees per acre, with large trees (greater than 30 inches diameter at breast height (dbh)), accounting for only about 4 percent of this density. Forest Service lands in the sub-watershed are predominantly forested with past timber harvest having occurred on approximately 35 percent of the forested lands with the remaining 65 percent having never been harvested.

The upper North Fork Siuslaw River ranges from 30-40 feet wide through the project area and has a two-year flow return interval of 982 cubic feet per second (CFS) (USGS StreamStats version 3.0). Due to the size, the river is dependent on the presence of very large down trees for the development of key high quality fish habitat that coho depend on at all life stages. These large trees function as major structural components and habitat-forming features in the floodplain and river channel. Historic stream-side timber harvest, clear-cut harvest, intensive replanting, stream cleanout, and splash damming has impacted salmon habitat quality in the river by removing in-stream large wood and altering the riparian forests in a manner that reduced their potential to replenish future large trees to the stream.

Dense plantation stocking of conifers has slowed diameter growth within these three units, (average dbh is 13-19 inches). Trees that might fall into the river channel from these stands from wind throw or suppression mortality, are not large enough to be; stable, function as key large wood, or accumulate material to form significant habitat features. At current stocking levels, desired densities of trees greater than 48 inches dbh will not occur for decades. Currently, there are approximately 60 large trees per mile within 100 feet of the river on National Forest lands. However, due to past timber harvest, these trees are largely concentrated in discontinuous pockets of old growth stands, that are not occurring in the three proposed treatment units. This number of large trees per mile is twice that which occurs on private lands above and below the project area and is only about ¼ of the number of large trees per mile that would be expected to occur in continuous mature streamside stands within the project area.

Over the last 20 years the SNF has continually placed wood into the upper North Fork Siuslaw River to restore fish habitat. The current instream structures are aging and are expected to fail in the next 10 to 20 years. Typically, whole, cut trees averaging 24 to 36 dbh are placed in the stream channel. The upper diameter limit is set by the US Fish and Wildlife Service within the range of the northern spotted owl and by weight limits that can be transported by helicopter. However, rivers the size of the upper North Fork Siuslaw River need trees of this size and larger to serve as a base and key anchor pieces that persist longer and serve as functional anchors for natural accumulation of smaller, easily transported wood.

The need for near-stream sources of large diameter trees to eventually take over and provide future inputs of large wood to the channel was identified in two landscape-scale assessments: the North Fork of the Siuslaw Watershed Analysis, and the Late-Successional Reserve Assessment for Oregon's Coast Province – Southern Portion. Based on the issues identified in these and other documents, as well as initial information gathered by the ID team, the following need for the project was identified:

There is a need to speed development of very large trees to serve as more functional anchors for salmon habitat structures. Reducing competition for light, water, and nutrients within the stand would speed development of very large trees and assist in providing more management and natural opportunities for fish habitat creation and/or improvement that would lead to recovery of full fish habitat function within this key reach, contributing to maintenance and recovery of this at-risk coho stock.

From the standpoint of restoring ecosystem function, future desirable key aquatic habitat and coho recovery, it is desirable for riparian stands to provide large wood to the river naturally. Current management of private lands for pasture and agriculture is likely to continue to limit the growth of very large trees along the stream and floodplain in the private land reaches. The best opportunity to grow and deliver very large trees and produce the highest quality habitat is within the low gradient reach on National Forest system lands.

Status of ESA Listed and Sensitive Species, Critical Habitat, and Essential Fish Habitat

Oregon Coast coho salmon (*Oncorhynchus kisutch*) in the project area are part of the Oregon Coast Evolutionarily Significant Unit (ESU) and are currently listed as a threatened species under the ESA with designated critical habitat and Essential Fish Habitat within the project area (see below for more information).

Steelhead (*Oncorhynchus mykiss* – Oregon Coast) in the project area are part of the respective Oregon Coast ESU and Distinct Population Segment (DPS) listed as species of Concern on April 15, 2004 under the ESA with no designated Critical Habitat on the Oregon Coast (NOAA Fisheries). However, this species is currently listed by the US Forest Service as Sensitive on the Regional Forester's Special Status Species List.

Pacific Lamprey (*Entosphenus tridentatus* – Oregon Coast) occur in the project area. The State status for this species is vulnerable, and it is also listed under the USDA Forest Service Region 6 Regional Forester as a Sensitive Species and listed on the Oregon State Director Sensitive Species List.

Status of the Oregon Coast Coho Salmon ESU and Designated Critical Habitat

Listing History

National Marine Fisheries Service (NMFS) first listed Oregon Coast coho salmon as a threatened species under ESA in 1998. The species was relisted in 2008 and reaffirmed as listed in 2011. The Final Oregon Coast Coho Salmon Recovery Plan (plan) was completed in 2015. The plan provides guidance to improve the viability of the species to the point that it meets the delisting criteria and no longer requires ESA protection. The complete plan for the Oregon Coast coho salmon can be found at the following web site:

http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead_listings/coho/oregon_coast_coho.html (accessed 09/25/2017).

General Population Status information

A detailed account of the status of the Oregon Coast coho salmon can be found on the NOAA/NMFS website:

http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/salmon_and_steelhead_listings/coho/oregon_coast_coho.html (accessed 09/25/2017).

Life History and Habitat Requirements

The biology and life history of the Oregon Coast coho salmon can be found on the NOAA/NMFS http://www.westcoast.fisheries.noaa.gov/protectedspecies/salmon_steelhead/salmon_and_steelhead_listings/coho/oregon_coast_coho.html (accessed 09/25/2017).

Populations within the Siuslaw River

Specific information on the status of the species within project area, which consists of the upper North Fork Siuslaw River sub-watershed, is not available and must be inferred from information available for the Siuslaw River Population. The Siuslaw River coho salmon population is one of six identified populations in the Mid-Coast Stratum (Lawson et al. 2007). The Mid-Coast Stratum ranked moderately low in both persistence and sustainability with three of the six populations ranking low and the remaining three, including the Siuslaw, ranking somewhat moderate (see Wainwright et al. 2008).

Adult returns to the Siuslaw River, like the ESU as a whole, are quite variable. Since harvest was reduced following the 1993 run year, escapement (post-harvest adult returns) has averaged 15,468 fish to the subbasin with a low of 501 fish in 1997 and a high of 55,445 fish in 2002. From 1994 to 2014 coho returns to the Siuslaw River have accounted for 10.2 percent of the returns to the ESU.

Critical Habitat within the Project Area

The geology of the upper North Fork Siuslaw sub-watershed is typical of much of the central Coast Range of Oregon. The parent material consists of tye sandstone, a highly friable and easily eroded rock formation. Because of this the valley floor tends to be low gradient but somewhat narrow and the hillsides rather steep. Fish-bearing streams occur on the valley floors with the upper limit of fish distribution usually occurring where the stream dramatically steepens and ascends the headwall.

The upper North Fork Siuslaw sub-watershed was historically dominated by coniferous forest with increased amounts of hardwoods in the moister soils of the riparian areas. In 1846, the Umpqua fire burned most of the watershed leaving only about 25 percent unburned, most of which was concentrated along the main stem of the North Fork Siuslaw through and upstream of the project area. The cause of the fire is unknown but was most likely due to lightning. As is typical of the Coast Range, the new forest would have had relatively light stocking levels due to competition with brush (USDA 1994).

The upper North Fork Siuslaw sub-watershed was part of the Alsea Sub-agency of the Coast Reservation from 1855 to 1875 after which it was opened to settlement. Most of the early settlement consisted of small farms and occurred in the wide floodplains of the lower North Fork Siuslaw sub-watershed. Some settlement and associated land clearing did occur in the Action Area, most notably along the main stem of the North Fork Siuslaw River upstream and downstream of the project area. These areas have remained in private ownership (USDA 1994).

Logging began in the late 1800s. Due to poor or non-existent roads most trees were harvested near streams and logs were transported to downstream mills by the river. Three splash dams were documented by Miller (2010) as having been present in the upper North Fork Siuslaw River sub-watershed and it appears that at least one of these dams was located upstream of all but one of the proposed thinning units.

Logging began in earnest after World War II. By the time the Northwest Forest Plan went into effect approximately 35 percent of the mature and over-mature forest stands on Forest Service lands had been harvested. Timber harvest during this time period typically had little if any streams buffers and usually included stream cleanout. The combination of splash dams, stream cleanout, and lack of buffers during harvest led to stream conditions with little wood and reduced streamside source conditions.

Fish habitat restoration efforts began relatively early in the North Fork Siuslaw River. The first large wood additions consisted of single logs anchored to the bedrock with cables or rebar. These restoration efforts have progressed to clusters of three to six logs strategically placed by helicopter in most coho-bearing streams in the upper North Fork Siuslaw River sub-watershed.

Since the Northwest Forest Plan went into effect in 1994 no clearcut harvest has occurred on Forest Service lands within the Action Area. The limited amount of timber harvest that has occurred has been focused on thinning tightly stocked plantations in order to recreate the more normal lighter stocking pattern of natural stands. Timber stands harvested by clearcut methods are currently re-growing and are already providing natural or above natural amounts of shade to smaller streams.

Indicator Baseline Condition and Effects of the Proposed Action

This section analyzes the effects of the proposed project on each indicator baseline condition.

Pool Frequency and Quality, Large Pools, Off-Channel Habitat, Refugia, Width to Depth Ratio, Streambank Condition and Floodplain Connectivity.

Thinning can reduce the amount of small wood recruitment in the short-term and this reduction would not be available to existing in-stream large wood structures. The amount of this reduction

relative to the total amount of small, mobile wood available in the system is quite small. Thinning will accelerate the development of large wood near the stream and its eventual recruitment to the stream. This larger wood is expected to significantly improve these indicators in the long-term. Thinning will therefore have a minimal, negative effect on the formation of pool frequency, quality, large pools, off-channel habitat, Refugia, width to depth, streambank condition and floodplain connectivity in the short-term and a larger, beneficial effect in the long-term.

The chance of fuels treatment on the terrace affecting any of these indicators is highly unlikely and therefore the effect of fuels treatment is discountable. The amount of change in wood presence on the floodplain from natural levels that should be present is minor and therefore the effects from yarding are insignificant.

Fuels treatment will have an insignificant effect on these indicators, yarding will have a discountable affect, and thinning a minimal, negative effect in the short-term and a larger, beneficial effect in the long-term. Overall, the project will have a minimal, negative effect on the formation of large pools, off-channel habitat, and floodplain connectivity in the short-term and a larger, beneficial effect in the long-term.

Water Temperature/Stream Shading

Thinning has the potential to increase daily maximum stream temperature in the short and mid-term (1 to 30 years) by reducing stream shade. Over the long term (>30 years) increased growth in retained trees has the potential to ameliorate stream temperatures through increased hyporheic exchange after the after the production and recruitment of large wood and the associated trapping of sediments in the stream channel. Fuels treatment, and log hauling will not remove any trees or alter shade to any stream and will therefore have a *neutral effect*.

Thermal loading is a major component of the energy budget of streams and can be modeled using NetMap's thermal loading tool (TerrainWorks 2016). The Forest used the NetMap thermal loading tool for the Riparian Thinning Project. The analysis included four thermal loading scenarios: 1) existing vegetation; 2) thinning with a 30-foot, no-harvest zone between the stream and the thinning area; 3) clearcut harvest with a 30-foot, no-harvest zone between the stream and the thin; and 4) bare earth (equivalent to a clearcut to the stream's edge). Although prescribed canopy cover reductions for the three thinning units ranged from 5 percent to 27 percent, all of the units were modeled conservatively with a 33 percent reduction in vegetation density for the thinning with 30-foot no-harvest zone scenario. The results of the modeling are displayed in Table 1.

Table 1 Results of the NetMap analysis on thermal loading.

Unit #	Thermal Load (Watt-Hours/m ²)				Percent Increase Relative to Bare Earth Increase (%)			
	No Treatment	Thin*	Clearcut w/buffer	Bare Earth	No Treatment	Thin*	Clearcut w/buffer	Bare Earth
607	793	825	909	4,225	0.0	0.8	3.4	100.0
607	847	880	1,001	4,376	0.0	0.8	4.4	100.0
607	804	838	912	4,382	0.0	0.5	3.0	100.0

* The thinning scenario is modeled with a 30-foot no harvest zone between the stream and the harvest area.

When compared to a clearcut with no buffers (bare earth) the increase in thermal loading for thinning with a 30-foot no-harvest zone next to the stream ranges from 0.6 to 0.9 percent. By comparison the increase for a clearcut with a 30-foot buffer was 2.0 to 4.4 percent, or about three to six times greater. Aspect greatly influenced the amount of increase, units with more northerly aspects (unit 703) having the least shade loss.

Past monitoring of shade by the SNF using hemispherical photography along streams near thinning units revealed little if any change. Preliminary results (report in preparation) of that monitoring show no statistically significant change in shade to the stream with some monitoring points showing a slight, one to three percent decrease in shade and other points with a slight increase in shade post-harvest (this is somewhat indicative that the changes in shade due to the thinning harvest were within the limits of detectability of this monitoring method).

The treatment of 15.4 acres of riparian plantations by thinning within the 9,962 acre catchment area that feeds water into the action area would not be expected to measurably increase stream temperatures. The retention of the 30 foot stream buffers, the small increase in thermal load anticipated from proposed thinning by NetMap modeling, the small treatment areas within 100 feet of the upper North Fork Siuslaw River that may be treated (4.6 acres spread across three units) and the retention of canopy cover above 50 percent indicate no more than very small increase in solar exposure would occur. Past research (Chan 2004 and Groom 2011) do not indicate the project proposal is likely to increase stream temperatures. The Forest Service is the dominate ownership upstream of the project area and the large forested drainage area upstream of the treatment units would be expected to buffer potential increases in stream temperature. Combining the site specific predicted impacts, literature sources, drainage area upstream, and ownership patterns no more than immeasurable impacts to the stream channel would be anticipated at the project site.

For these reasons the project was determined to have an insignificant negative effect on stream temperature in the short-term (20-30 years) as a result of shade loss.

Improved hyporheic exchange could lead to some long-term improvement in stream temperatures. Currently, the tree diameters in the stands proposed for treatment are too small to be functional in the river. Research (Beechie et al, 2000) suggests, the minimum size trees needed to be functional in a channel the size of the upper North Fork Siuslaw (25m wide) is 60 cm (24in). As identified in the Riparian Evaluation Science Reports (2013), these stands would benefit from thinning from below to increase recruitment of pool-forming wood. While thinning from below would reduce the overall volume of wood that is potentially recruited to the channel, especially in smaller size classes (<24 inches), the volume of potential wood recruitment of larger diameter pieces is increased over the long term (100 years) (Riparian Evaluation 2013). The proposed thinning will increase the diameter growth rates of the residual conifer trees and will shorten the length of time needed for near-stream trees to reach the size suggested by Pollock *et al.* (2009) as being necessary to retain sediments, re-establish hyporheic exchange, and recover natural temperature regimes.

Although some large woody material has been added to the upper North Fork Siuslaw River, the life-span of this wood is currently limited along with the near-stream supply of large trees needed to naturally fall into the river as replacements. The ability to continually place large wood into the

river in the future is uncertain and a near-stream, future supply of wood is needed if hyporheic exchange is to help ameliorate fluctuations in daily temperatures in the long-term.

The amount of benefit to stream temperature (reduced daily fluctuation, reduced daily highs, and increased nightly lows) from hyporheic exchange is not known. With the proposed 30 buffer/no harvest zone and the residual trees that will remain in the stand it is unlikely there will be a measurable increase in stream temperature in the short-term. In the long-term, large wood recruitment is expected to trap sediment and increase the complexity of the stream allowing for improved hyporheic exchange. Increased hyporheic exchange is likely to reduce seven day average maximum temperatures but it is unknown to what extent this will occur or if the decrease would be measurable.

Large Wood Material

Thinning has the potential to change the distribution, size, and abundance of woody material available for future recruitment into streams. For this project; yarding, hauling, and pile and burning will not affect instream large wood, and will therefore have a neutral affect to this indicator. Thinning will have a short-term negative affect and a long-term beneficial effect to this indicator.

Most of the small diameter wood generated from suppression mortality is unlikely to meet the 24-inch diameter specified for the large wood indicator (effects of the loss of small wood will be discuss in the section on Pool Frequency and Quality). Thinning the riparian stands of this small diameter wood may have very localized indirect effects to spawning and rearing habitat in the short-term. Over the long-term treatment will reduce the time needed to develop large wood. For a discussion on the effects from the loss of small, less than 24-inch in diameter wood please see the section on Pool Frequency and Quality.

Direct and Indirect Effects – Embeddedness/Fine Sediment Suspended Sediment/Turbidity & Substrate Character/Embeddedness

Yarding activities can compact, expose, and displace soils. Compacted soils slow the infiltration of water leading to increased surface runoff. Exposed soils, those soils that have had their covering of duff and vegetation removed, are susceptible to displacement from runoff including displacement that delivers sediment to streams. The type and extent of soil exposure plays a role in the amount of sediment displacement, with small, patchy or discontinuous exposure yielding little displacement compared to extensive, continuous exposure. Slope also plays a critical factor in sediment delivery. Compacted surfaces that lead to stream channels may also play an important role in delivery from treatment units.

Several studies have documented the ability of undisturbed vegetative strips between harvest units and streams in reducing erosion and sediment delivery. Vegetative strips ranging in width from 40 to 100 feet appear to prevent sediment from reaching streams (Burroughs and King 1989, Corbett and Lynch 1985, Gomi et al. 2005). Lakel (2010) concluded that streamside management zones between 25 and 100 feet were effective in trapping sediment before it could enter streams.

The project will use ground-based yarding methods (skidders or forwarders) that will operate on designated skid trails to limit the extent of disturbance to soils. Ground-based equipment will only be allowed to operate between August 6 and October 15 when soils are relatively dry to lessen the amount of compaction. Skid trails will originate next to roads and progress out through

the three units at mostly right angles towards the stream. Skids trails will be relatively short due to the small size and narrow shape of the units. The short nature of the skid trails requires relatively few passes by the equipment to yard the logs to the landing. There will be a 40 foot no-equipment buffer around all streams.

The ground within the units is currently well vegetated, but some soil exposure is expected. Soil exposure will be greatest near the road-end of the skid trail where every pass of the equipment will occur and least near the stream-end of the skid trail where only one or two passes must be made. Due to the small volume of wood needing to be yarded on any one skid trail, soil exposure is expected to be patchy with less exposure at the stream-end of the skid trail and more near the road-end of the skid trail. Due to the vegetation, duff, and flat terrain of the units, little soil displacement is expected beyond a few feet from any exposed patch of soil. The 40-foot-wide unharvested and undisturbed strip of vegetation between the units and the stream is expected to capture any soil displacement that is an exception to this scenario.

Because the units are relatively flat and little ground disturbance will occur on the stream end of the skid trail and no ground skidding equipment will operate within 40 feet of the stream it is highly unlikely that sediment will be generated and transported to the upper North Fork Siuslaw River.

Chemical Contaminations/Nutrients

Gas powered equipment will be used to fall, limb and buck trees selected for thinning. Equipment will be used within the unit boundaries within 40 feet of coho CH. No refueling is allowed within 50 feet of any stream. Heavy equipment (yarder/skidder) and will be refueled at landings or service areas only; located at a minimum of 150 feet away from all stream channels. Fuel treatment involves the use of petroleum products to ignite hand piles that are typically more than 100 feet from streams but can be as close as 40 feet. Refueling drip torches will occur at landings or service areas, a minimum of 150 feet from streams. It is highly unlikely that thinning, yarding, log hauling, and fuels treatment will affect nutrient and chemical contaminant indicators.

Physical Barriers

There are no proposed project activities that would add or remove physical barriers.

Change in Peak/Base Flows

Thinning to reduce stand densities and enhance the growth of larger conifers in the riparian area has the potential to impact peak and base flows in the short term but would be considered insignificant and discountable and thus not meaningfully measurable to the above indicator.

Measurable changes in peak and base flows caused by canopy manipulation (interception and evapotranspiration) are dependent on the extent of canopy that is altered. Similarly, changes in flow caused by soil compaction are also dependent on the extent of area compacted. No clearcut harvest has occurred since 1994 and these previously harvested lands are now in advanced stages of forest regeneration.

The project proposes to thin and yard from approximately 15.4 acres of the 9,962 acres that drain to the action area. The amount of canopy reduction in the harvest units averages less than 20 percent (range 5 to 27 percent). This small amount of canopy reduction is extremely unlikely to cause a measurable change in peak or base flows due to changes in precipitation interception or evapotranspiration. Yarding will occur on designated skid trails designed to keep detrimental soil

compaction below 20 percent for each unit (including landings). This small amount of compaction is also extremely unlikely to cause a measurable affect to stream flows.

Fuels treatment associated with the project are limited to burning small hand piles and piles on landings. The burning of piles creates a relatively high intensity fire that removes vegetation and duff, and also leads to the creation of hydrophobic soils. This leads to increased runoff from the area that the pile was located. The extent of burned area for each of these piles is small (8 X 8 feet), and they have a discontinuous distribution with approximately 20 feet between piles. Because of their discontinuous distribution and the flat nature of the units in which the piles were created, any runoff from the burned areas is likely to infiltrate into the unburned areas between the piles. In addition, the burned area constitutes less than 10 percent of the 15.4 acres of thinning.

Riparian Reserves

The three units that constitute the project were originally harvested between 1955 and 1967 (Table 1). After harvest the cleared land was replanted in a dense monoculture of Douglas fir. These dense conifer stocking levels are not natural in the wet riparian areas of the western hemlock/salmonberry plant association where, after a natural disturbance such as a stand replacement fire, initially comes back as brush. In these natural stands, the few trees that do break out above the brush grow in open conditions with little competition for light (Jane Kertis, Ecologist, Siuslaw National Forest, personal communication). These trees then grow rapidly adding diameter at a fast rate, having high live crown ratios, and large diameter live limbs relatively low on the bole of the tree (Poage and Tappeiner 2002).

Two of the three stands in the project area have been thinned previously to improve tree growth. The increase in the amount of light to the ground has allowed for shrub and some hardwood development. However, diameter growth of the conifers in these stands are beginning to slow.

Thinning will continue to keep the stand growing in more open conditions allowing the residual trees to develop a more natural growth form and for the stands to develop a more natural community and composition. This includes large limb development for marbled murrelet nesting, multi-story structure for northern spotted owls, and continued development of shrubs and forbs needed for amphibians (USDA Forest Service 2015).

Road Density and Location

The project will not add, remove, or relocate any roads and therefore has no causal mechanisms to affect this indicator.

Disturbance History

Forest Service lands in the subwatershed are predominantly forested with past timber harvest having occurred on approximately 35 percent of the forested lands with the remaining 65 percent having never been harvested. No clear-cut harvest has occurred since 1994 and these previously harvested lands are now in advanced stages of forest regeneration.

The disturbance regime is a set of natural processes that can add or diminish risk to fish populations. Thinning can increase the risk of a large, catastrophic fire starting by increasing the amount of fine fuels present in the three units. However, pile and burning can reduce this risk. Although large fires can be a dominant, natural component of the disturbance regime they also

pose risk to fish populations and can be large enough to affect all the components within an entire refugia.

Characteristics of the thinning units that also reduce and increase the risk are; the flat, lowland nature of the terrain and the presence of the paved road. Fire starts will initially have a slow rate of spread due to the flat nature and humid conditions of the thinning units, allowing time for fire suppression. The presence of the road however increases chances of a fire starting due to increased human activity, however, can be used as a fuel break if a fire start occurs off the road. Fuels treatment endeavors to return the risk to pre-thinning levels by treating those fuels closest to human activity.

Fuels treatment will consist of piling and burning slash from the thinning operations within 100 feet of the county road and the North Fork Campground. Fine fuels generated by the thinning process pose a potential risk to the health of the riparian area. Treatment of the fuels next to the road and campground will reduce the probability of ignition of these fuels throughout the thinned area. Within three to five years the remaining fine fuels in the thinned riparian areas will decompose to the point where they no longer pose a fire danger. Due to fuels treatment the risk of serious wildfire is maintained at low, pre-thinning levels.

Direct and Indirect Effects to the Species

The project was designed to avoid all instream and streambank activities. However, negative effects to coho salmon could possibly be caused by thirteen of the habitat indicators. Pool Frequency and Quality has minor, negative effects that are both short- and long-term but, as discussed below, this does not affect the limiting factor for coho salmon.

The effect on the Pool Frequency and Quality indicator is relatively small but still negative and could cause a seasonal reduction in coho parr. This is because the possibility exists that one or more trees removed from within 100 feet of the upper North Fork Siuslaw River could, if they had been left un-thinned, died of suppression mortality and fallen into CH. The percentage of these trees that would actually create habitat for coho is probably very small due to the smaller than average size of tree that tends to die from suppression mortality, rot and vertical decomposition of dead trees without falling, and increased breakage rates due to rot if the dead tree should not fall immediately after death while still sound. Although these factors reduce the amount of suppressed and dead trees that would be recruited to the stream they do not completely eliminate dead tree recruitment.

Dead trees recruited to the stream through suppression mortality can create pool habitat and provide cover. Beechie and Sibley (1997) found that smaller wood, such as that produced through suppression mortality, can produce pools in alluvial substrates. In their study wood was classified as pool-forming when it was stable and forced the flow in a direction consistent with the scour of the pool (Beechie and Sibley 1997). Although past splash damming and stream cleanout has greatly reduced the amount alluvial substrates present in the North Fork Siuslaw River, some gravel and finer sediments are present and smaller wood pieces could create some scour and associated low-flow pools. The removal of potential small wood recruitment through thinning is likely to reduce the potential for future low-flow pool habitat to some degree. Due to the amount of small wood reaching the stream, the amount of breakage of this wood due to rot, the small size of the wood relative to the size of the stream, and the scarcity of suitable alluvial substrate, the number of potential future pools that will not form due to thinning is expected to be few.

Reduced low-flow pool habitat will reduce the summer carrying capacity for juvenile coho salmon in the upper North Fork Siuslaw River. Some juvenile coho that could have utilized this habitat will instead perish due to increased competition, reduced growth, and displacement at the stream-reach scale (smaller, displaced fish are more susceptible to predation). However, because the limiting factor for coho is over-winter habitat, any loss of summer parr production is unlikely to carry over through the winter and affect spring smolt output. In the long-term larger pieces of woody material produced by the thinning are likely to increase log jams and provide more winter habitat outside of main stream channels, boosting the freshwater productivity of this species.

Ten of the indicators have long-term, beneficial effects to the riparian habitat. All of these long-term positive effects are dependent on creation large trees near the stream for recruitment at a later point in time. Eight of these indicators affect habitat elements related to over-wintering aquatic habitat. Improved over-wintering habitat will allow for increase survival of parr through the winter and increase smolt production in the spring.

Four of the ten indicators that were found to have long-term beneficial effects (Large pools, Off-Channel Habitat, Refugia, and Floodplain Connectivity) also have potential to have short-term negative effects to coho salmon and steelhead. In all four instances these negative effects were related reduced potential for small wood and were found to be minor due to the amount of small wood recruitment from other sources.

Several of the indicators will also affect summer habitat conditions in the long-term, including substrate and temperature. Increased substrate depth can improve hyporheic exchange leading to reductions in temperature fluctuations and daily high temperatures. Through this process improved summer conditions would occur at about same time as improved winter conditions and some of the increase in summer parr production could be expected to carry-over into spring smolt production.

The project has the potential to increase the amount of available light that reaches the stream (see Temperature indicator discussion above). Any increase in light would increase primary production in the stream that could in turn increase aquatic invertebrate production. These aquatic invertebrates constitute the bulk of the juvenile coho and steelhead diet in freshwater.

Short-term vs. Long-term Risk

The project clearly has potential for some small, short-term, negative effects but has even greater potential for meaningful, positive, long-term, lasting effects. The long-term effects are considered meaningful because they address the limiting factor for coho production in the Siuslaw Basin. Balancing short-term detriment to long-term benefit is a difficult decision and involves trade-offs.

In the long-term additional stressors will be applied to freshwater production due to climate change and additional human development activities caused by an ever increasing human population. Possible scenarios for climate change include increased stream temperature and an even more variable hydrograph. The long-term, beneficial effects of the project will add resiliency to the coho population from these future stressors by ameliorating the effects of increased stream temperatures with hyporheic exchange; dampening the variability of the hydrograph through floodplain re-connectivity; and providing much needed, additional off-channel habitats.

Given that the short-term potential negative effects are minor and the population is currently relatively healthy, the short-term risk to the population caused by the project appears to be low.

On the other hand, because the project directly addresses limiting factors for smolt production and lessens the effect of future stressors, the long-term benefits of the project appear to be high. By reducing long-term risk the project is effectively preparing the OC coho salmon habitat in the upper North Fork Siuslaw River for the future.

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

Past, present, and reasonably foreseeable future activities that affect the project area include:

- Past timber harvest
- Non-native plant suppression treatments
- Developed recreation ongoing maintenance
- Transportation maintenance
- Firewood cutting
- Aquatic restoration activities through ARBO II

Project details are available in the master list in the EA. Existing conditions reflect the cumulative effects of past and present activities that have occurred in the project area as part of the baseline condition. Cumulative effects were assessed for this project in terms of how the proposed project would add to the past, present, and reasonably foreseeable future activities.

Aggregated Federal Effects

The Siuslaw National Forest is invasive plant treatments on or in the vicinity of LFH within the project area under separate NEPA analyses that would have effects on coho salmon and their habitat. Consultation for these activities would utilize the Fish Habitat Restoration Activities in Oregon and Washington, ARBO II CY2013 Biological Opinion (NMFS Consultation Number: NWR-2013-9664, 2013).

We are not aware of any other proposed federal actions for which a Biological Assessment has been submitted contemporaneously with this BE, which would affect the ESA action area for this project. All ongoing actions with potential adverse effects (where ESA consultation has been concluded), and effects of completed federal actions, are included in the environmental baseline for each indicator and have been considered in this analysis.

Essential Fish Habitat Assessment

When the Magnuson-Stevens Act of 1976 was re-authorized in 1996, it directed Regional Fishery Management Councils to identify Essential Fish Habitat (EFH) for commercial fish species of concern. Effects analysis contained in this Biological Evaluation address potential effects to EFH. Two species may be impacted by this project, Coho and Chinook salmon. Chinook salmon are distributed in the North Fork Siuslaw River, and use the basin for spawning and early rearing. Juvenile chinook generally migrate out of fresh water by June, and continue rearing in estuary areas over the summer. There is some overlap in freshwater areas and the analysis conducted for coho is sufficient for Chinook. Coho salmon distribution and Coho Essential Fish Habitat was analyzed above and documented the existing habitat conditions and the effects of the project on coho salmon and their habitat in the project area.

Management Indicator Species

Management indicator species (MIS) were selected because a change in their population, in response to management activities, is believed to represent changes in a larger group of species. Coho salmon were selected as a MIS for an ecological indicator, an indicator for fish species, and represent pool and low gradient stream habitat for the Siuslaw National Forest (USDA Forest Service 1990). The discussion above has documented existing coho habitat conditions in the project area and the effects of the project on coho and their habitat. The documentation concluded that commercial thinning associated with the project would have “likely to adversely affect” coho salmon or their critical habitat in the short-term, with long-term benefits.

Special Status Species

Regional Forester's Special Status Species (SSS) include; Pacific lamprey, Chum salmon, and steelhead occupied habitat within the project area. Chum salmon occur in the lower portions of the watershed, and the effects from the project would not be delivered to their habitat. Pacific lamprey and steelhead occupy similar habitat as coho, except that steelhead extend further upstream in some locations. Activities proposed in the project area would follow the project design criteria for BMPs described in Appendix A, including the 30 foot no treatment buffer, and 40 foot equipment exclusion zone.

Thinning associated with project would accelerate the development of large diameter trees in the riparian and may result in a minor reduction in small wood recruitment to steelhead habitat. There is a decreasing probability that these pieces would fall directly toward the stream as the no thin buffer width is increased. Activities described in the project would not contribute to a loss of viability, or cause a significant trend toward listing under the Endanger Species Act for either of these species.

Cumulative Effects

Cumulative effects are the effects of the action when combined with any other current or reasonably foreseeable actions in the project area. The private land within the project area is primarily located downstream. It is expected that development and land use outside the project area by the state and private property owners would continue in the future in a manner similar to that of recent years. It is also expected that activities on these lands would comply with county, state, and federal laws and regulations.

Overall, it is assumed that the temporary and short-term effects from project activities would not compromise the benefits of restoration, and thus, water quality (sediment and temperature) across the Forest and is expected to improve as the project is implemented to restore healthy, functioning late serial riparian conditions and associated aquatic ecosystems.

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Appendices

Appendix A: Project Design Criteria and Best Management Practices

The following project design criteria (PDCs) are project- and site-specific best management practices (BMPs) developed for the upper North Fork Siuslaw River Riparian Thin Project and are consistent with the USDA National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP technical guide (USDA forest service 2012).

Criteria number	Objective	Design criteria for the project
Aquatics		
Aquatics-1	Reduce burn severity and soil impacts and preserve habitat in riparian areas	Hand piles – Riparian Areas <ul style="list-style-type: none"> No hand piling would occur within 40 feet from the stream channel Hand piles should not exceed 60 piles per acre to keep pile area less than 5% of riparian area. Hand piles should be approximately 8 feet x 8 feet, and 20 feet apart. Where possible, retain large wood that is at least 10 feet long and 12 inches or greater. In units where these criteria are not possible, consult with an aquatic specialist.
Aquatics-2	Protect bank stability	Conifer felling – Riparian Areas <ul style="list-style-type: none"> There is a 30 foot no treatment buffer from any stream Conifers will be felled away from the stream
Aquatics-3	Reduce soil impacts and prevent sediment delivery to streams	Mechanized equipment – Ground based logging activities – Riparian Areas <ul style="list-style-type: none"> There would be an equipment exclusion zone of 40 feet of any stream There would be no skidding/yarding across stream channels There would be no landings in riparian areas
Aquatics-4	Reduce potential for sediment delivery to streams	Log haul - exemptions Roads exempt from hauling restrictions (due to no mechanism for sediment delivery) include paved roads, surfaced ridge top roads, surfaced outslowed roads with no ditch or stream crossings.
Aquatics-5	Reduce potential for chemical contaminants in waterbodies	Fueling in Riparian Areas <ul style="list-style-type: none"> No fueling of chainsaws would occur within 50 feet of stream channels. Any fueling that needs to occur within 50' would be confined with in a spill container (Ex. Volume pumps for drafting water). Heavy equipment (yarder/skidder) and will be refueled at landings or service areas only; located at a minimum of 150 feet away from all stream channels. Refueling drip torches will occur at landings or service areas, a minimum of 150 feet from streams.

Criteria number	Objective	Design criteria for the project
Aquatics-6		<i>Thinning Treatments</i> <ul style="list-style-type: none">• Create average of 4 snags per acre• Fall and leave 2 trees per acre• No yarding will occur past October 15